

## **Evaluation Key for the Avery Low Tech (ALT) Method for Pfeiffer Circular Chromatography (PCC)**

In the book *This Bokashi Alternative is Rubbish: Bokashi and Pfeiffer Chromatography Simplified*, you learned how to do PCC. However, this key was not included because of the smaller format.

The key is learning to evaluate PCC, which takes time and practice. While I can answer questions about my technique, I do not evaluate chromatograms for others. The best way to use PCC is to observe changes in the chromas over time as the soil or compost changes.

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Always keep in mind that chromatograms are qualitative and personal in that they have more meaning to you than anyone else. Don't over-read them; "sense" them. To practice your evaluation skills, use a known good sample from worm castings, good-quality organic compost, or some biodynamic soil that you can trust to be very fertile, as well as a sample you can tell is poor-quality soil, so you can see both ends of the scale (best to worst).

Instructions:

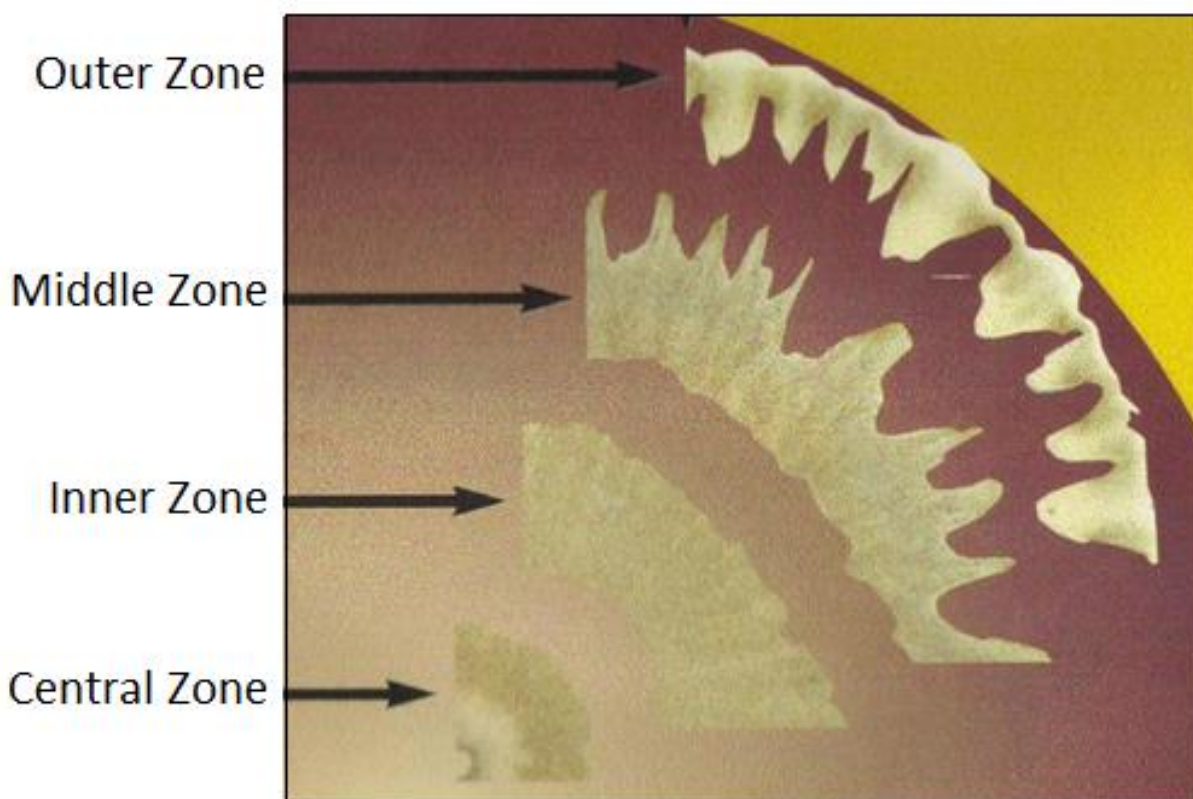
1. Make copies of the Evaluation Worksheet for each sample.
2. Evaluate your chromatogram using the eleven components (1A–1D and 2A–2F).
3. Enter the Evaluation Points for each component evaluated into the appropriate row (either the value 1.0, 2.5, or 4.0).
4. Total the Evaluation Points
5. Count the number of rows with Evaluation Points (you may not use them all) and divide that number into the total to get the Average Evaluation Points.
6. Compare that value to the scale provided on the worksheet to get a general interpretation of your chromatogram.

*Note: The key was developed from two sources, one of which no longer exists. Attempts have been made to seek permission without success. If there is a problem with using them in this manner, please contact us.*

*Evaluation components 2A–2F is courtesy of SoilTech.*

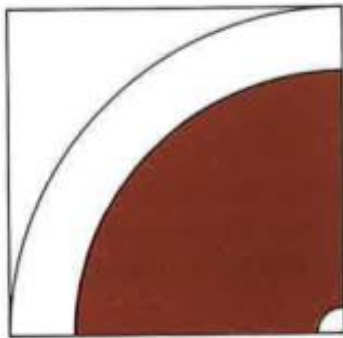
*These keys were originally intended for soil, and while they can help you understand the nature of the chromatogram, not all components will apply to samples other than soil, like worm castings and compost.*

### **Chroma Analysis (paraphrased from German)**

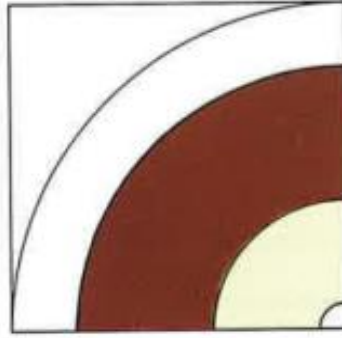


A chroma gives a general view about the quality of soil or compost. A chroma contains four zones. Each specific zone indicates a certain quality aspect. Rate the following components of the sample and enter the values on the Evaluation Score Worksheet (component numbers are 1A-1D and 2A-2F).

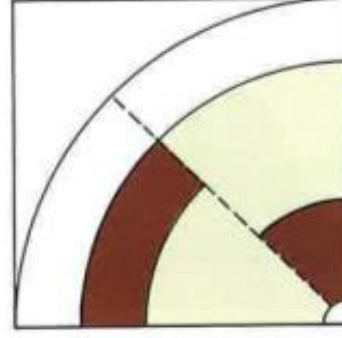
**1A External Area:** The outer region of the chromatogram gives information about the microbial activity, which is responsible for the breakdown of organic substances by bacteria and fungi. If the outer regions of the chromatogram are "cloud-like" and have well-rounded peaks, there is high microbial activity. Sharper spikes that extend as far as the outer edge of the chromatogram show lower microbial activity. No clouds or spikes indicate no microbial activity.



1.0 (Points)

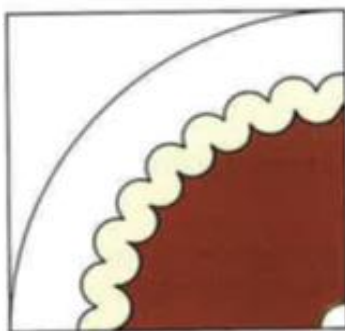


2.5 (Points)

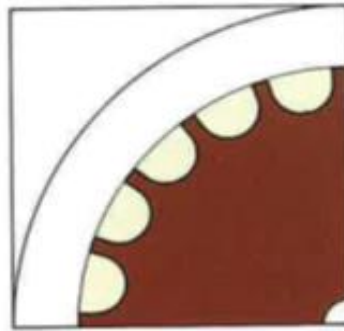


4.0 (Points)

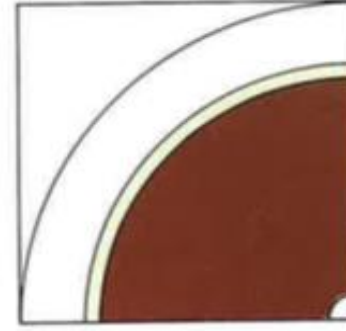
**1B Distribution of the Brown:** Provides information about the humus structure. If the brown color is from the outer region to the center of the chromatogram, the humus structure is good. If the brown color does not extend fully from the outer area to the center, then the humus buildup is medium. If the brown color is only in the outer region of the chromatogram, many untreated plant residues are present, and the humus composition is poor. The brown color is only in the inner region of the chromatogram when the humus particles are largely dismantled. This condition is also bad.



1.0 (Points)

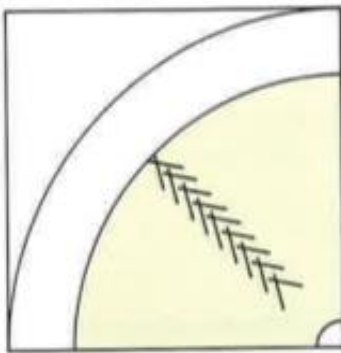


2.5 (Points)

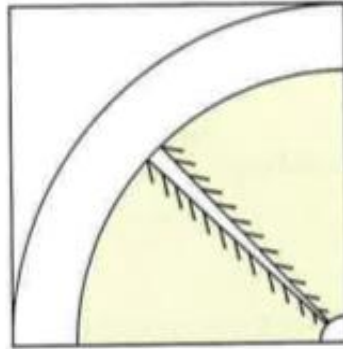


4.0 (Points)

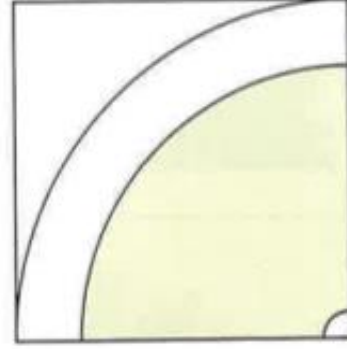
**1C Form of the Radial Strips:** The radial strips provide information about the structure and about the soil type. When radial strips are present and these are feathered structures like a "mare's tail," the soil has a good structure. When radial strips are present and are less like the mare's tail, the soil has a good structure but is less desirable. If there are no radial strips, the soil lacks structure.



1.0 (Points)

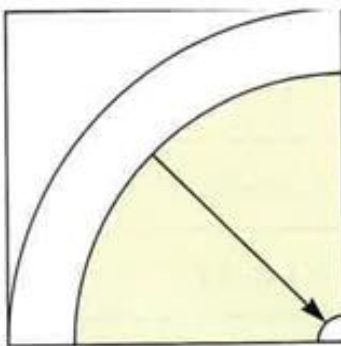


2.5 (Points)

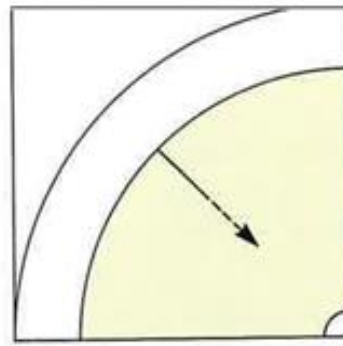


4.0 (Points)

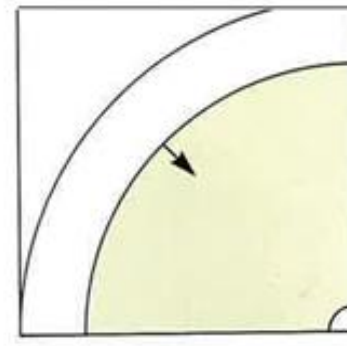
**1D Length of the Radial Strips:** The length of the radial strips provides information about the compaction. When the radial stripes extend from the outer region to the center of the chromatogram, the soil is loose. When the radial stripes extend from the outside region but not to the center of the chromatogram, the soil is mediumly compacted. When there are no radial strips or only traces in the outer area of the chromatogram, the soil is strongly compacted.



1.0 (Points)



2.5 (Points)



4.0 (Points)



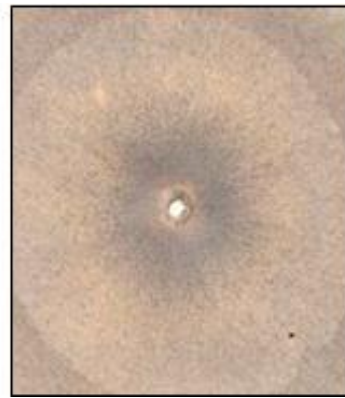
**2A Central Zone:** This zone gives an indication of the general soil fertility. A fertile soil gives a white-colored zone. A disturbed soil will show a dark zone. When the zone is too small or too large in relation to the other zones, this will be a result of the poor composition of the soil.



1.0 (Points)



2.5 (Points)



4.0 (Points)

**2B Inner Zone:** This zone indicates the water and air holding capacity of the soil and the structure of the soil. This means the structure of the soil is built by the soil's life and not by machines. The zone should show clear lines that lead from the central zone up to the outer zone. Then the soil is well-structured and aerated. If the zone doesn't contain these lines, the soil might be compacted and not have enough water-holding capacity.



1.0 (Points)



2.5 (Points)

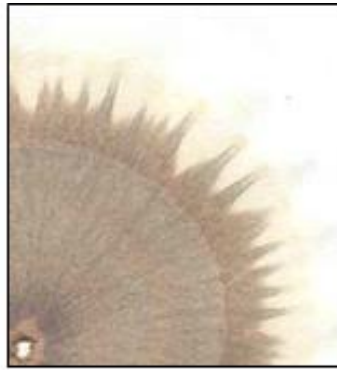


4.0 (Points)

**2C Middle Zone:** This zone shows the quality of the soil life. The zone should be evenly covered with spikes. The zone also needs to be wide enough. If the zone shows shallow spikes or no spikes at all, then the soil life is not active enough or not present in adequate amounts.



1.0 (Points)



2.5 (Points)



4.0 (Points)

**2D Outer Zone:** This zone indicates the condition of the humus in the soil. It shows the quality of the organic matter in the soil. This can vary from raw organic matter up to stable humus. In a soil with a good humus condition (stable humus), this zone shows a light brown or beige color. Raw organic matter or burned organic matter (poor-quality compost) shows a dark brown closed zone.



1.0 (Points)



2.5 (Points)



4.0 (Points)

**2E Ratio between the Zones:** The width of the zones should be in ratio to each other in a balanced soil. If one zone is small or narrow and the other one is wide or large, then the chroma is out of balance. This also means that the soil is not yet in balance. A chroma with a good spreading of the zones is an indication of a balanced soil.



1.0 (Points)



2.5 (Points)



4.0 (Points)

**2F Transition between the Zones:** When the soil is in balance, the zones of the chroma will blend into each other. This property will only show itself when the soil is already in a high-quality condition.



1.0 (Points)



2.5 (Points)



4.0 (Points)



## Evaluation Score Worksheet

Date:

Sample:



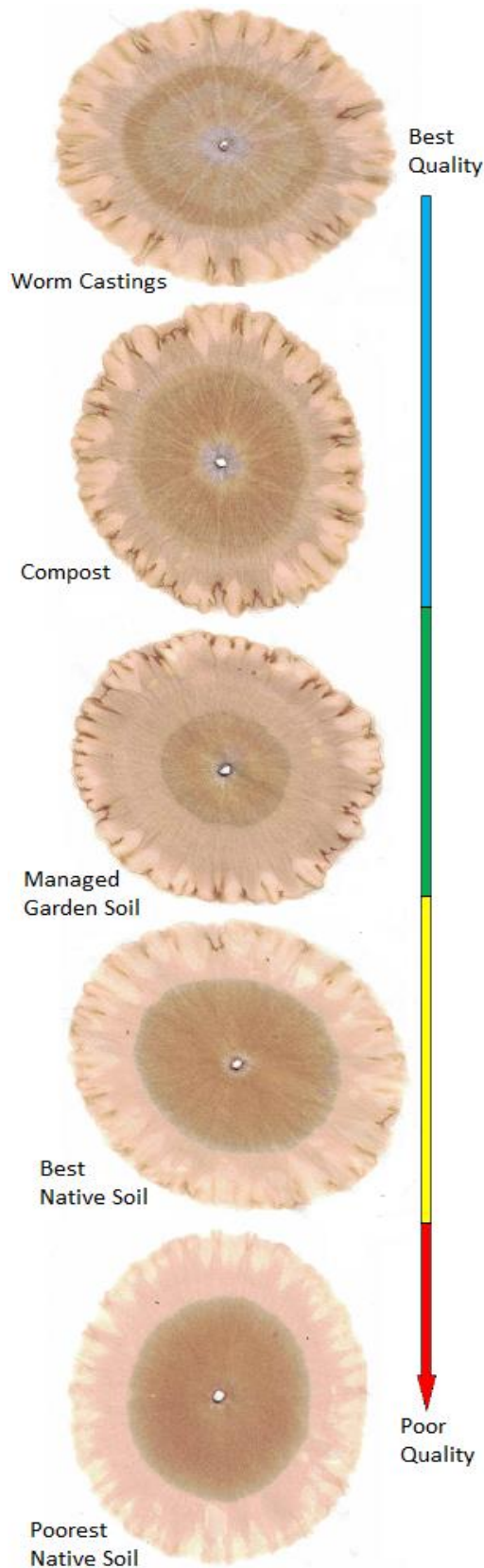
Worst



Component	Points
1A External Area	
1B Distribution of Brown Color	
1C Form of Radial Stripe	
1D Length of Radial Stripes	
2A Central Zone	
2B Inner Zone	
2C Middle Zone	
2D Outer Zone	
2E Ratio Between Zones	
2F Transition Between Zones	
Total	
Average (Total/Number of Components)	

Average Points	Sample Quality
>3.2 to 4.0 (Worst)	
>2.4 to 3.2	
>1.6 to 2.4	
1.0 to 1.6 (Best)	

## Examples of Evaluating Your Chromatograms



The uppermost sample is worm castings from my worm bin. Next is my yard compost, followed by our raised garden beds that have had compost and worm tea applied to them. The last two are the sandy native soils on our property.

Going from best quality to poor quality the first observation is the external area (1A). Notice the decrease in microbial activity between the top and bottom. In addition, the colors of the outer zones are more beige and brown at the top, turning pink at the bottom. The worm castings and compost do show some raw organic matter, which is expected from the worm bedding and indicates the compost is not fully aged.

The middle zone is much diminished in the native soil samples, indicating decreased soil life (2C). The form and length of the radial strips are hard to see in these smaller images, but they definitely diminish as you move from best to poor (1C and 1D).

It is also easy to see that the number of zones and the transitions between zones decrease as you move down the scale.

This chart shows how I would read these chromatograms. Of course, I had the originals to examine.

Keep in mind that this is a qualitative procedure, and the evaluation key is an attempt to make it somewhat quantitative. Don't over-read them. It is more important to use them to show improvement over time than just numbers.

The better the quality, the better the chromatogram looks, and it gives you a feeling or impression of improvement.

Component	Worm Castings	Compost	Garden	Best Native	Poorest Native
1A	1.0	1.0	1.0	2.5	2.5
1B	1.0	1.0	2.5	2.5	2.5
1C	1.0	1.0	2.5	2.5	4.0
1D	1.0	1.0	1.0	2.5	4.0
2A	1.0	1.0	2.5	2.5	4.0
2B	1.0	1.0	1.0	2.5	2.5
2C	1.0	1.0	2.5	2.5	4.0
2D	2.5	2.5	2.5	4.0	4.0
2E	1.0	1.0	2.5	4.0	4.0
2F	1.0	1.0	2.5	4.0	4.0
Total	11.5	11.5	20.5	29.5	35.5
Average	1.15	1.15	2.05	2.95	3.55

When these chromatograms were done a “standard” was also included. In this case it was worm castings. So, the compost rated very much like worm castings (since it had been made using “worm tea” instead of water during the composting process) while the poorest native soil showed very little life and organic matter.

Notice that as the values increase the quality goes down. If the procedure is done repeatedly over time and the values decrease then sample is improving.

The most valuable use of PCC is not to evaluate a sample once; it is to evaluate it over time. This will allow you to see where changes occur. This is why consistency (precision) is important in your technique.

When you do these over time the key is helpful to understand what component is changing and what that might mean.